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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ARITHMETIC.

147. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

Stock bought $m=10\%$ above par, pays $p=8\%$ on the investment. What per cent. will it pay if bought at $n=10\%$ discount?

II. Solution by G. B. M. ZERR, A. M., Ph. D., The Temple College, Philadelphia, Pa.; W. P. WEBBER, Mississippi Normal College, Houston, Miss.; F. L. SAWYER, Mitchell, Ontario, Can.; and M. E. GRABER, Heidelberg University, Tiffin, O.

$$p(100+m) \div (100-n) = \frac{p(100+m)}{100-n} \%$$

But $m=10\%$, $p=8\%$, $n=10\%$.

$$\therefore \frac{8(100+10)}{100-10} = \frac{880}{90} = 9\frac{8}{9} \%$$

NOTE.—We publish a second solution of this problem because there was some criticism on the solution published in the last number of the MONTHLY. We agreed with Mr. Lawrence in his interpretation of the problem, and for that reason published his solution. We clearly see how the problem may be interpreted in accordance with above solution, and that is the interpretation intended by the proposer. ED. F.

148. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

According to his contract a professor is to receive \$1800. in cash plus board, etc., for his services during a scholastic year of nine months. This sum is payable in equal installments of \$200. at the end of each scholastic month. The treasurer, however, paid the professor in ten equal installments of \$180. The last two installments were paid Monday and Thursday of the last week in the scholastic year. Regarding money worth 6%, out of how much was the professor defrauded by the wiley treasurer?

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

$$\$20(.04 + .035 + .03 + .025 + .02 + .015 + .01 + .005) = \$20 \times .18 = \$3.60.$$

He paid him \$180 4 days before due.

$$\$180 \times .00\frac{2}{3} = 12 \text{ cents. } \$3.60 - \$0.12 = \$3.48.$$

149. Proposed by JOSIAH H. DRUMMOND, LL. D., Portland, Me.

A wine cask contains 256 gallons of wine; a certain quantity is drawn off and the cask is filled with water; the same quantity of the mixture is drawn off and the cask is again filled with water and so on for four draughts, when there remain only 81 gallons of wine in the cask. How many gallons of wine are drawn at each of the draughts? [Colburn's *Algebra*.]

I. Solution by JAMES F. LAWRENCE, A. B., Rogers Academy, Rogers, Ark.; S. F. NORRIS, Baltimore City College, Baltimore, Md.; and G. B. M. ZERE, A. M., Ph. D., The Temple College, Philadelphia, Pa.

Let $a=256$ =the contents of the cask.

x =the amount taken out at each draught,=64.

$a-x$ =the amount of wine after first drawing.

$\frac{a-x}{a}$ =proportion of wine to each gallon of mixture.

$\frac{x(a-x)}{a}$ =amount of wine drawn off at second drawing,=48.

$\frac{(a-x)^2}{a}$ =amount of wine after second drawing.

$\frac{x(a-x)^2}{a^2}$ =amount of wine drawn off at third drawing,=36.

$\frac{(a-x)^3}{a^2}$ =amount of wine after third drawing.

$\frac{x(a-x)^3}{a^2}$ =amount of wine drawn off at fourth drawing,=27.

$\frac{(a-x)^4}{a^3}$ =amount of wine after fourth drawing.

b =amount of wine after fourth drawing.

$\therefore \frac{(a-x)^4}{a^3}=b. \quad a-x=\sqrt[4]{(a^3b)}. \quad x=a-\sqrt[4]{(a^3b)}=64.$

Solved in like manner by C. A. LINDEMANN, M. E. GRABER, and P. S. BERG.
Professor Norris sent in a second solution which generalizes the following solution.

II. Solution by D. B. NORTHRUP, Mandana, N. Y., and the PROPOSER.

If one half of the wine is left after the first draught, of course one quarter is left after the second, one eighth after the third, and one sixteenth after the fourth. Hence the number of gallons left after the fourth draught divided by the whole quantity is the fourth power of the proportion left after the first draught. So the fourth root of $\frac{81}{256}=\frac{3}{4}$, the proportion left, and $\frac{1}{4}=64$ =number of gallons first drawn, and 48, 36, and 27 the number at each of the other draughts.

ALGEBRA.

127. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

Sum to n terms the series

$$\frac{4}{1 \cdot 2 \cdot 3} \cdot \frac{1}{3} + \frac{5}{2 \cdot 3 \cdot 4} \cdot \frac{1}{3^2} + \frac{6}{3 \cdot 4 \cdot 5} \cdot \frac{1}{3^3} + \dots$$